DOCUMENT RESUME

ED 251 442 SP 025 485

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TITLE Investigative Pedagogy: Engine of Research and Theory in Teaching.
PUB DATE Aug 84
NOTE 26p.
PUB TYPE Viewpoints (120) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Cognitive Processes; Cognitive Style; *Educational Research; Higher Education; *Learning Strategies; Preservice Teacher Education; *Problem Solving; Research Utilization; *Task Analysis; Teacher Effectiveness; *Teaching Methods

ABSTRACT

Contradictory research findings on teachers and teaching are frequently the result of overlooking or neglecting a systematic approach to teaching, using principles of human learning to enhance pupils' learning and their enjoyment of learning. In discussing teacher preparation, it is pointed out that task analysis is a crucial operation, in which three main aspects of training courses--practical teaching, pedagogical theory, and the study of teaching subjects--come together and reveal their interdependence. It is suggested that if training institutions develop an exploratory, problem-solving approach to teaching, the ground is prepared for an accretion of information from small-scale classroom studies that are more likely to contribute to understanding of teaching than are research projects producing theoretical suggestions rather than practical ways to deal with the actual teaching process. A sketch is presented of a system of supervision in teacher education which uses an exploratory, cooperative, problem-solving approach. A description is given of a training course for supervisors in this kind of program, and the pedagogical investigations carried out by its alumni are described. (JD)

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INVESTIGATIVE PEDAGOGY: ENGINE OF RESEARCH AND THEORY IN TEACHING

Professor Edgar Stones: August 1984

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Preamble

I think it important to preface my talk with a few remarks by way of background to the current scene as far as teacher training in UK is concerned. I say the UK, but I am well aware that similar tendencies obtain in the US and probably some other countries too. A recent British government White Paper (HMSO 1983) probably sums up the state of affairs as well as anything. It is an appalling document going under the title of Teaching Quality whose recommendations or directives are likely to set back the development of teacher education for years to come.

The main burden of the paper is that the things that matter in teacher education are the main academic subjects and student practical teaching, and training institutions are being 'advised' to focus on these two elements. Systematic study of the theory and practice of teaching are not mentioned. Instead the view is that teaching is subject and age range specific and that teachers must be trained narrowly for service in the appropriate category. There is no recognition of any generic teaching principles of wide application. It is most distressing to me that no training

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institutions, colleges, universities or polytechnics, have denounced the document. Far from it, most of them have caved in quite supinely and accepted the diktat of the minister and are restructuring their courses along the lines prescribed although they go against most of the values and procedures they have espoused and promulgated for many years. I am heartened a little by the fact that a belated opposition is arising in some institutions, to what effect, remains to be seen.

It is a tragic fact that this current line is part cause but mainly a consequence of the past neglect of systematic pedagogy by the training institutions. Too many members of faculty have clutched their academic purity to their bosoms and spurned attempts to relate their work to practical teaching. And for too long practical teaching has been seen as a non problemmatic sitting with Nellie activity.

As my paper will reveal, I am totally opposed to the current line of the British governmen even though I have been a critic of the neglect of pedagogy by training institutions for many years. (Stones 1983) Now, ironically, I am in the position of defending them against a greater ill. I am, of course, aware that I am taking on a weighty opposition. However, politicians are transient and ideas with any substance are more likely to persist and one continues in the hope that the ideas are worth while. As I imply throughout the paper, however, the proof of the pudding

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is in the eating. It is my hope that my taste and yours are not too far apart.

Across the great divide:

In a charitable comment to the National Foundation for Educational Research (UK) in October 1982, Sir Keith Joseph, the British Minister of Education, responsible for the White Paper, remarked that educational research on classroom teaching is patchy and urged researchers to make good use of their findings by helping teachers employ them in the classroom. (TES Oct. 1982)

I use the word charitable since much research in schools and teaching has very little potential for being employed by teachers. An important reason for this state of affairs is that the research has been predominantly descriptive of the way schools and teachers are at the moment and little concerned with the way they might be.

I have caricatured this problem as it applies to research into teacher personality by taking some of the aspects of personality assessment, popular with researchers, in a book on pedagogy. 'Knowing that "research shows" that good teachers are informal, extrovert, democratic, female is of little help to teachers who are formal, introvert, authoritarian, and male.' As Professor N Entwistle commented on the subject of research in student

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personality: 'It still requires considerable faith and imagination to see where these results may lead.' (Stones 1984a)

The missing ingredient

Amen to that. It may not be impossible for teachers to change their personalities to some extent, or even their sex, but in my view there is a more important and practicable way of changing teachers that could affect the relationship between teaching and research. It lies in the province of teacher education and involves the equipping of student teachers to go beyond current modes of teaching into more exploratory approaches. It is the changing of teachers' pedagogy not their personalities that offers more hope of progress and this is what I should like to consider in this paper.

The introduction to the Russian translation of my book on psychology and pedagogy sums up beautifully and succinctly the approach I espouse.

> For the author, the book's overriding task is to substantiate the assertion that serious improvement in teaching practice is possible only through application of the findings of psychology. The teacher should take the experimenter's role, test out teaching theory in classroom conditions. It is actual teaching practice that provides the

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most reliable and important method of testing the psychological theory on whose basis general educational principles are formulated. Application of these principles must also increase the effectiveness of teaching. If this does not happen, then the principles in use should be re-examined.

Constructing his teaching method in conjunction with scientific data, the teacher accustoms himself to verifying psychological truths, not accepting them at face value. Stones stresses that, in this way, the fusion of psychological learning theory with teaching practice is very important both for the development of learning theory as well as for the improvement of the teaching process in schools. (Talyzina 1984)

'Method' research

One type of research which has occupied the attention of researchers over the years is the comparison of different 'methods' of teaching. I have mentioned some already; comparisons such as formal/informal, democratic/authoritarian, but there are many others. For example, is it best to try to teach by 'whole' or by 'part'? Does asking probing questions enhance learning more than yes/no questions? Are language labs better for teaching aspects of French than teachers? Can programmed learning teach as

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well as or better than a teacher? Is film better than audio tape? And, a burning question at the moment, can a micro-computer teach as well as a teacher?

Many permutations of these variables have been employed in a variety of researches and often puzzling contradictions appear. Sometimes one 'method' seems to work best and sometimes the other. The 'challenge' presented by these contradictory results is sometimes tackled by sophisticated statistical techniques, themselves often of considerable interest to the researchers in which they attempt to isolate the key factor(s) in producing the observed effects.

It is my view that a most important reason for these problematical findings is that, whatever the level of sophistication of experimental design, there is very frequently a crucial educational oversight; it is the neglect of a pedagogical dimension. By pedagogy I mean a systematic approach to teaching, such as that outlined in Talyzina's remarks, that makes such use of principles of human learning as may be possible to enhance pupils' learning and their enjoyment of learning.

I realise that this summary definition begs many questions and needs to be expanded to make clear, for example, what my understanding of appropriate pupil learning is, and it may be considered by others to be only part of the story. I would not

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dispute this, but consider that it refers to probably the most important element in pedagogy. I will attempt to spell out later what my view of appropriate pupil learning is. My point now is that very frequently researchers report the effects of different treatments such as I have discussed above without even considering the fact that there may be very different approaches to pedagogy involved in the treatments. But, perhaps most crucially, there is rarely any analysis to see to what extent the practices being studied attempt to make use of knowledge from the study of human learning that may affect the outcomes of teaching.

Here are a few examples of what I mean. Research has been conducted to ascertain to what extent students' notes after attending lectures resemble what the lecturer said. (Hartley and Marshal 1974) Whatever the finding it cannot be anything but trivial in comparison with the pedagogical question: is listening to lectures and taking notes a useful form of learning? Another, more subtle example is seen in a book by Rosenshine (1971) in which he reported on several researches on the effects of different approaches to questioning by teachers. He found, contrary to what might have been expected from research into questioning, that one study showed that simple questions demanding yes/no answers resulted in better pupil learning than probing questions. Gall (1973), reviewing the work, pointed out that when the nature of the test assesssing the pupils' learning was taken into account there was no problem since the test was a

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simple test of rote learning and the teacher would have been better employed just drilling the pupils rather than 'wasting time' getting them to think. Gall suggested that a more likely fruitful approach to research in the field of pupil learning and teacher action than the correlation approach reported would be to encourage an explicit rationale based on psychological theory to research in this area. A very recent comprehensive review of research by Clark (1983) into the effects of different media in teaching concluded that no learning effects could be attributed to the media as such and that the focus of attention should be on instructional methods and the nature of the learning task, a similar view to Gall's. A recent issue of the Teachers' College Record (Aug 1984) is also sceptical about the prospects for computer based learning, and in this connection, I refer you to the book by Joseph Weizenbaum, Computer Power and Human Reason

Medium or message?

The common factor in conventional studies is that the pedagogy is not under scrutiny. In the main lecturers are trying to tell or explain something to the students, so are teachers and so are all the users of all the media referred to in Clark's review. The implication is that the pedagogy in the various approaches is the same. It is seen predominantly as a process of 'telling' or transmitting information. The important focus of attention is the medium of transmission of the teacher's message. Given a

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predominantly transmission mode of teaching it makes sense to focus on the means of transmission but only if researchers are accepting a static and unitary view of pedagogy. If, however, one conceives of different pedagogical approaches drawing on principles of human learning in a dynamic exploratory way, the question of 'transmission' is very much reduced in importance. More important approaches explore ways of teaching for meanings and not just words. They seek to build on the learned meanings by helping pupils to acquire skills of problem solving that will help them to deal with real life situations. Pupil learning should be transferable to situations they have not previously encountered and methods of assessing learning should test that transferability.

Pedagogical skills

If we are to obtain any insights into ways of helping pupils in learning of these kinds it will be necessary to draw on information from the study of human learning in such fields as meaningful learning and problem solving. When we learn meanings we learn much more than the words the teacher uses, we learn the concepts the words stand for. Concepts are abstractions of the general idea of things and are built up by our experience of the real world and particularly our use of language and by our interaction with people. If we lack experience related to the concept a teacher is trying to teach, we just learn the words by

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rote and will be unable to make any use of it outside the conditions in which the teacher taught it. As the Russian psychologist, Vigotsky, said: 'The words cover a conceptual vacuum'. Unfortunately, although there is information from learning psychology about how people learn concepts it is rarely if ever used in training institutions to help students teach concepts in a systematic way.

It is true that one can build up concepts on the basis of other concepts so that highly abstract cognitive structures are acquired, but all depend in the end on the foundation of personal experience. This is a fact of psychological life that is all too often overlooked by officiandos of computer based learning and educational television, not to mention millions of chalk and talk teachers and lecturers in higher education.

Teaching concepts is perhaps the basic pedagogical skill. It contributes to successful problem solving since to be able to solve problems in a particular field one needs to have an understanding of the main concepts in the field. We also have information about methods of enhancing problem solving that should be drawn on in teaching. Other vital aspects of the psychology of human learning relate to the teaching of motor skills and the development of pupil motivation.

Motivation, of course, has been given attention by the behaviour

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modification movement. In my view it needs a less narrow view than is commonly taken. Like the other aspects of teaching I have mentioned, it also needs to be proved, in the original sense, i.e. tested, in typical teaching situations. In the work I have done with practising teachers, the one aspect of their work that they consistently misapprehend is in this field. Without exception teachers over-estimate the amount of reinforcement in the form of encouragement or praise they give their students. In fact, my experience suggests, that, except for a few particularly fortunate students, classrooms are pretty unrewarding places to be in.

A pedagogical skill that cuts across the others mentioned, is that of task analysis. By this I mean the systematic analysis of the teaching to identify the key elements involved and their inter-relationships. It is a vital first step in determining the appropriate teaching strategy. In my approach to task analysis I consider it essential to attempt to identify the nature of the pupil-learning hoped for since the nature of the teaching depends on the type of learning involved. For example, task analysis of aspects of foreign language teaching would reveal that the learning of vocabulary was akin to paired associate learning, whereas the learning of grammatical structures usually involves the learning of concepts of different levels of generality. Thus the teaching of vocabulary would involve quite different pedagogical techniques from those appropriate to the teaching of

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grammatical structures. Task analysis also involves the teacher in making decisions about the nature and method of providing feedback, of the structuring of the teaching and of devising methods of assessing learning that emphasise transferability and eschew testing of rote learning, except when simple types of learning are being tested as in vocabulary learning. I have circulated one or two handouts with examples of the approach taken from different fields.

These few examples from a wealth of information about human learning make it clear that the staple mode of teaching by telling is of very limited efficacy. To achieve more complex and more useful modes of learning, systematic approaches to the optimum arrangement of pupils' experiences are crucial. Those experiences should rely very much less on teacher talk and much more on pupil activity and possibly pupil talk.

But activity in itself is no guarantee of productive learning. It must be related to some understanding by the teacher of the pedagogical/psychological processes operating in the learning experiences of the pupils or the activity might well be as sterile and rote as <u>learning</u> by being told.

These are just an enormously simplified outline of the type of thing involved in a pedagogical approach. I have provided much more detail elsewhere. (Stones 1984a) In working with practising

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teachers I have found that few know anything at all about any of these quite crucial aspects of human learning. This is not surprising in view of their neglect both by classroom researchers and training institutions. However, I have also found that most have found the approach very helpful in their work as have pre-service teachers.

Let me try to illustrate these various points by reference to a most interesting example, of the type of investigation I am considering, reported by Martland in the Journal of Teacher Education in January 1983. Martland was a teacher of mathematics and now a member of faculty of Liverpool University. He has an interest in orienteering, a competitive running sport in which the competitor solves navigational problems with the aid of map and compass, usually in woods or forests. Working under my supervision for a higher degree, he conducted an experiment in the teaching of orienteering to children aged about 11. This subject was chosen partly because of Martland's own interests but also because it involved several important and quite complex types of learning, especially in the teaching of geography and mathematics. There was the further interest in that, in his view, orienteering is generally very poorly taught, comprising little more that transmission teaching at the theoretical phase, and 'show and tell' at the practical phase. (Not unlike teaching!) As Martland tackled it, it involved concept learning, learning of psychomotor skills and problem solving. He found that the

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systematic use of the matrix for task analysis particularly beneficial in planning a sequence of lessons and used various schedules that I had developed as heuristic guides to action in the interactive aspect of the teaching.(Stones 1984a)

It is impossible to do justice to this investigation in a short space of time and I urge you to read the original. Very briefly, he administered pre-tests to 53 pupils and ascertained whether they had the concept of a bearing as set out in the analyis. Most had not and two pupils from each of the high, the medium and the low scoring pupils were chosen for the teaching phase. Only six pupils were selected because the whole process was being filmed. The teaching over several lessons progresses from classroom work building up the concept of bearing as shown in the handout, through work in the school grounds, to running orienteering routes in the woods. At all stages knowledge taken from psychology related to the different types of learning is drawn on and formative evaluation made at crucial points in the learning. Success in the final running of a bearing through woodland was one of the main criteria of competence by the pupils and the success of the teaching. Success was virtually 100%. An additional criterion of the efficacy of the teaching of problem solving techniques was the elegance of the solution of novel orienteering problems as assessed by a leading British orienteer. In all cases the pupils came up with solutions of a consistently high standard of elegance.

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This bald description does not begin to convey the pedagogical richness of this teaching experiment. But one small incident observed on the film says a great deal about its nature. An orienteering expert invited to evaluate the performance of the pupils went through a traditional show and tell routine and as he loped away among the trees the pupils spontaneously critiqued his performance as if it were a protocol in the sense outlined originally by B O Smith.

Pedagogy and research

But apart from the benefits to teaching that might accrue from taking the study of pedagogy seriously, there are also very important considerations for the nature of research in teaching. The kind of investigations that seem to offer most mileage in the search for useful pedagogical insights preclude sporadic raids by bands of researchers. Instead they depend absolutely on the development of stable teams of workers from different institutions that, one would imagine, would consider pedagogy to be their prime concern, such as schools and teacher training institutions. Students, teachers and the staff of the training institutions could work co-operatively exploring the relevance of findings about the nature of human learning to teaching. This kind of work involves a profound reappraisal of concerns and approaches by training institutions

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The supervisor: agent for change in teaching?

Work of this kind with practising and student teachers over the years has convinced me that the key to development in teaching lies in a reassessment of the role of supervisor of student teachers. Currently supervisors of practical teaching are drawn ad lib from college staff when teaching practice time comes round. They may or may not be staff with knowledge of human learning and they may not have had any previous contact with the students they are to supervise. It is almost certain that they will have had no formal induction into the task of supervision. Everything conspires against the implementation of a rigorous approach to theory-based teaching and students are forced into a transmission mode since it is unlikely that anyone will discuss other approaches with them.

Supervisors with a responsibility for inducting students into pedagogical theory could break the vicious circle in which student teachers perpetuate kinds of teaching they experienced as pupils and observe in the teachers presented to them as models. They could do this by reappraising the nature of supervision and taking it to be much more extensive and more rigorous than at present. It would become more extensive by reaching out into the training course as a whole with the supervisor taking responsibility for theoretical pedagogical studies as well as

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practical teaching. It becomes more rigorous because practical teaching becomes more firmly rooted in theoretical studies in pedagogy.

Both these changes demand considerable shifts in current thinking about course structures and the relationship between educational studies, professional studies, the 'main subjects', and school experience. There is another extremely important point. As Talyzina's introduction suggests, it is not possible merely to 'apply' theoretical knowledge about the nature of human learning to teaching in any mechanical way. It will probably never be possible to do this, but at the present time it is out of the question, even if it were thought desirable. I say this because most of the work on human learning has been carried out in non education situations, and almost all the research in teaching has been done without reference to the nature of the learning involved. There is no question of the pedagogical theory I espouse leading to recipe teaching. Each lesson is seen as it truly is, a unique encounter in which a teacher is tackling a pedagogical problem, to enhance the pupils' learning in all its aspects. This is the investigative pedagogy of my title. And the key type of learning the student teacher should be trying to encourage in pupils, is how to tackle and solve problems.

Supervisors, themselves, are also trying to solve problems. How best to help student teachers acquire theory-based systematic and

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effective teaching skills. Supervision is, in short, a form of teaching and in their own work supervisors try to implement the principles they are trying to teach their students. Thus supervision implies a co-operative venture. The student has a teaching problem, the proposed lesson. Supervisor and student examine the problem together in the light of the pedagogical principles they have discussed earlier in the course. The student plans lessons and appraises them later in co-operation with the supervisor who assumes a counselling or advisory role rather than an adjudicatory one. The teacher in the practice school can also be involved in what becomes a triangular co-operative enterprise. The process can be very fruitfully extended by involving student teachers' peers in the evaluation of each others' teaching, not by commenting on the surface or cosmetic aspects, but, by the use of protocol material, in the way it relates to pedagogical principles discussed and tried out previously.

The role of subject tutors is very significant when this type of approach is adopted. I have found at least as much interest among them as among tutors in professional studies or education departments and, indeed, many of those who find questions of pedagogy intriquing are subject tutors, perhaps task analysis in particular. The conceptual structure of specific subjects of study is rarely seriously scrutinised in academic courses, but it is central to pedagogical analysis since, unless the structure is revealed, it is difficult, probably impossible, to implement

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appropriate teaching procedures. And it is in carrying out this kind of analysis that flawed assumptions about the nature of subjects are revealed.

An interesting example of this was brought to my attention by two members of a pedagogy research group with which I was associated. The subject was the teaching of melody in music. The collaborators were a music teacher in a secondary school and a member of faculty of a college of higher education responsible for teacher training. Their analysis revealed that the standard approach to the teaching of melody, that they (and most music teachers) had used for years, was flawed and did not stand up to logical analysis. (Alston and Pollington 1982) One of the pair took the approach further in an experimental study of the teaching of simple musical composition. Pollington, the music teacher, set about teaching the concepts involved along the lines I have been describing. He improved teaching at the same time as he shed new light on the nature of the pedagogy of music teaching. His work was a model of the investigative pedagogy of my title. He makes one statement at the end of his report that I think is of considerable importance. He says, as a practising teacher: 'If teaching is to become effective and accountable, it needs an approach such as this. It is not expensive, nor is it time consuming once initiated'. (Pollington 1982)

Task analysis is also the crucial operation in which the three

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main aspects of training courses, practical teaching, pedagogical theory, and the study of the teaching subjects, come together and reveal their inextricability. You cannot talk about any one of the three elements without reference to the others. The experience of the music research group reveals this, but all other specific subject teaching does also. I have frequently discovered that when graduate students in specific subject fields or even practising teachers do this type of analysis it reveals considerable misapprehension of the nature of fundamental concepts in subject fields as well as in pedagogy. It seems to me that there is not only scope for considerable coming together of these three strands of institutional structures but that such movement is also highly desirable.

Supervision and research

Apart from the value of a view of supervision and pedagogy, such as I have outlined, for student teacher learning, I do not think it pretentious to suggest that it may have implications for research in teaching. It is unlikely to produce outcomes of the block busting proportions of well funded research projects. But if training institutions, their students and schools develop an exploratory, problem solving approach to teaching the ground is prepared for an accretion of information from small scale studies that, because they are founded in the schools and involve the practitioners, are more likely to contribute to our understanding

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of teaching in the long run than the one shot forays I referred to.

This brief sketch of a system of supervision that suggests an exploratory, co-perative, problem solving approach, can only hint at its possibilities. I have spelled them out more fully in a book on supervision which gives examples from work of this type, by teachers and supervisors. (Stones 1984b) I have also written at greater length about a course of training for supervisors that I ran for ten years at Liverpool that refers to some of the pedagogical investigations carried out by its alumni. (Stones 1984c) It seems to me to offer a fruitful avenue to explore for anyone concerned to make links between educational research and practical teaching. It may prove uncomfortable for some, however, since it will put research findings to the acid test by investigating their usefulness in practice. It could well facilitate the development of new approaches to research in teaching by teachers themselves which could make a genuine contribution to our understanding of pedagogy.

It may well be that the time is propitious for an approach of this type. There is currently abroad in discussions of educational research, the notion of 'teachers as researchers'. Pangs of conscience among research workers who have hitherto taken teachers and students as the material or 'subjects' for research, have led to the espousal of an approach that proclaims

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the involvement of teachers in research. The sharing of a sterile activity, however, will not add to its effectiveness. If research is to enhance pupil learning by more effective teacher action then it must turn its attention towards pedagogy, and, in my view, research in pedagogy cannot be done without joint activity between teachers and researchers.

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